Injury Extra (2006) **37**, 225–227

www.elsevier.com/locate/inext

CASE REPORT

Limb entrapment in a swimming pool suction outlet: A multidisciplinary approach to in-hospital extrication

N.A. Toosy*, **B. Brookes**

London (NW) Deanery, Central Middlesex Hospital, Park Royal, London, UK

Accepted 5 December 2005

Case

A 3-year-old female child was brought to Accident & Emergency Department by the emergency services without prior warning.

Earlier the child had put her dominant right arm in the polyvinyl chloride (PVC) extraction pipe of a previously drained swimming pool in order to retrieve a toy. The emergency services were called. The emergency services attended within 30 min, but were unsuccessful in freeing the entrapped limb. The emergency services had to dig around the child and cut the pipe with a 6 in. margin of clearance beyond the fingers. The child was brought into the department approximately 2 h after the initial call-out with the thick PVC pipe attached to the right arm up to the level of the elbow.

The child and parents were distressed. It was difficult to assess the skin and circulation of the entrapped limb due to limited access available though there were no gross injuries of note. Initial attempts to free the limb after mild sedation with 1:1 nitrous oxide/oxygen and 2.8 mg oral morphine sulphate syrup (10 mg/5 ml) and the use of liberally applied Tetracaine 4% gel liberally applied with water soluble lubricant were unsuccessful. An oscillating plaster-cutting saw did not prove to be useful due to the toughness of the material. The vibrations also caused an increased level of anxiety.

After initial reluctance and after intervention by the A&E Consultant, the Orthopaedic team took over the care of the patient. The child was taken to theatre and a general anaesthetic was administered approximately 1 h after arrival in hospital.

An initial circumferential cut was made just distal the fingers using a hand-held saw in order to assess the state of the circulation and provide a better view of the arm to direct extrication (Fig. 1). The sawing was left to the firemen who had more experience with the equipment while the procedure was directed by the medical team. A second horizontal cut was made at the level of the wrist as this offered the greatest clearance.

Unfortunately, the arm remained firmly stuck and a longitudinal cut had to be made. The dorsal surface of the forearm was protected using a malleable retractor, which was inserted using lubrication, and the pipe was divided (Fig. 2). The arm was then successfully extricated using a spreader to increase the circumference of the pipe. The procedure took ~1 h 15 min (Fig. 3).

* Corresponding author. Tel. +44 1372 844634; fax: +44 1372 844634.
E-mail address: ntoosy@aol.com (N.A. Toosy).

1572-3461
doi:10.1016/j.injury.2005.12.004

Figure 1 Entrapped arm after removal of segment distal to wrist.

Figure 3 The cyanosed limb shortly after extrication.

Though initially cyanosed (Fig. 4), the capillary return improved quickly and over the next few hours the child was able to move the limb in a satisfactory manner. There were no signs suggestive of compromised circulation, skin damage or compartment syndrome. The limb was elevated in a Bradford sling overnight and by next morning the limb seemed to have regained near normal sensation and movement. X-rays showed an un-displaced greenstick fracture of the second metacarpal, though it is likely to have occurred at the time of the initial extrication attempts.

The child was discharged after overnight observations.

Discussion

Entrapment in a swimming pool's suction outlet is well described.[2] However, a search of the Department of Trade and Industry (UK) website failed to find a mention of this. The Consumer Product Safety Commission (USA) has documented 126 cases of entrapment from 1990 to 2003 resulting in 25 deaths (11 due to hair entrapment and 14 due to limb/body entrapment).[1] The deaths occurred in swimming pools full of water. The CPSC also issues guidelines on prevention of such incidents as well as guidelines for design improvement of suction outlets.[3]

Compartment syndrome in the limb requiring fasciotomies has also been described.[6] The development of compartment syndrome has been linked with the suction pump on the filtration device as well as the length of time that a limb is entrapped.

Compartment syndrome is a serious complication leading to ischaemic nerve and muscle damage as well as rhabdomyolysis.[4,5] Though limb entrapment is a rare cause of rhabdomyolysis, early management and close observation are important to prevent complications.

Figure 2 Removal of the forearm segment in progress (malleable retractor and spreader can be seen).

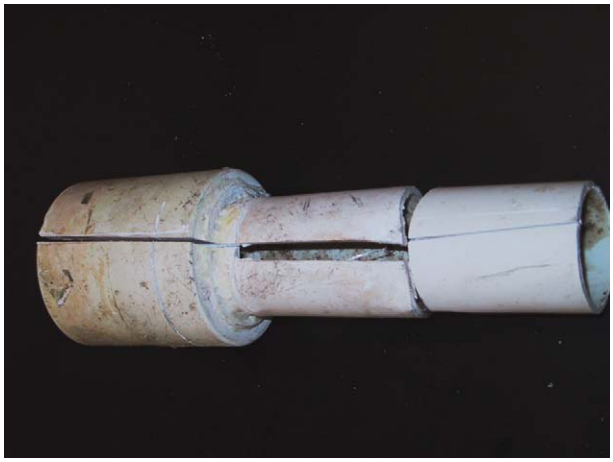

Figure 4 The PVC pipe after extrication.

Fortunately in our case early action and cooperation between in-hospital medical teams and the emergency services meant that the child recovered uneventfully.

Conclusion

Recognition and anticipation of the complications of a seemingly innocuous problem is essential to prevent further morbidity. Initial unsuccessful extrication in A&E, despite the use of adjuncts, necessitated expeditious intervention. The design and installation of suction outlets of swimming pools needs to be looked at by the relevant regulatory bodies to prevent further incidents of entrapment that threaten life and limb.

References

1. CPSC memorandum to Roy Whitfield: Hair entanglement, entrapment and disembowelment associated with Spas, Swimming Pools and Wading Pools since January 1, 1990. Roy W, EHHA; October 25, 1996.
2. Dworkin G, Pool and spa entrapment. www.lifesaving.com/issues/articles/17pool_spa_entrapment.html.
3. Guidelines for Entrapment Hazards: Making pools and spas safe. U.S. Consumer Product Safety Commission; 2001.
4. Matsen FA, Clawson DK. Compartment syndromes. Clin Orthop 1975;113:2.
5. Matsen FA, Vaith RG. Compartment syndrome in children. J Pediatr Orthop 1983;641.
6. Shin AY, Chambers H, Wilkins KE, Bucknall A. Suction injuries in children leading to acute compartment syndrome of the interosseous muscles of the hand: case reports. J Hand Surg (Am) 1996;21(4):675—8.